"Empowering students to fulfill their dreams"

E-Rate Deployed Ubiquitously (EDU)
2011 Pilot Program <u>INTERIM REPORT</u>

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Executive Summary

When the EDU2011 (Learning on the Go) program was announced, the Piedmont City School District was fully implementing MPower Piedmont. The vision of MPower Piedmont was to "transform our community." Obviously, transformation of a community is no easy task. The goals that were set centered on our school district. Those goals included:

1. Creating a digital learning environment in all classrooms.
2. Developing 21st Century Skills in all students.

In order to accomplish these goals, all classrooms were upgraded with mounted projectors, wireless slates (interactive whiteboard capability), and sound systems. Additionally, a fast, secure, wireless network was installed (utilizing E-rate funds). A learning management system (LMS) was put in place. Finally, laptops were purchased for all students in grades 4-12. Students were given access to their laptops 24 hours a day, 7 days a week.

Although, schools were opened late, public libraries and community centers offered Internet access, and churches and local restaurants upgraded to wireless Internet access. Stakeholders quickly realized that in a school district where at least 65% of the students were eligible for Free or Reduced Lunch, Internet access at home was a major issue.

Unique Model
The EDU2011 proposal that was approved for the PCSD was different than the other 19 applicants. Most applicants provided Internet access to students through 3G/4G access through a vendor-supplied device (phone, tablet, netbook). The PCSD model is a long-term solution that is device independent. This aspect is vital because school districts that are implementing one-to-one initiatives upgrade devices at least every four years. Devices will be upgraded in the PCSD at the end of this school year.

Uniqueness sometimes brings extra costs. Our solution is long-term, but it had a $1.5 million installation cost that was amortized over three-years (due to E-rate requirements). Our solution ultimately brought a new Internet supplier into our community. Hopefully, the vendor will eventually offer access to the vendor-owned wireless network over our city to public offices, private businesses, and citizens as a whole. We feel this aligns directly to the goals of the National Broadband Plan to bring broadband access to rural America.

Approximately 200 school districts from across the Southeast have visited the Piedmont City School District in the last year to see how we are transforming our district and community. Our teachers regularly comment that the one-to-one aspect is important but "Internet access at home is what allows us to take instruction to a level that most districts never experience."

Long Term Funding
Because the solution to Internet access at home is unique, it does not fit nicely into the

existing E-rate funding rules. If we were providing Internet access at school to students through a device with vendor supplied 3G/4G access, we could cost allocate the percentage of Internet access that was being used at home. Although, this might be an affordable solution under existing rules, it certainly would not be the best solution.

The goal of the FCC by conducting the EDU2011 pilot was "to investigate the merits and challenges of wireless off-premises connectivity services, and to help the Commission determine whether they should ultimately be eligible for E-rate support." We believe that our model, which is proving to be very successful, certainly is providing valuable data to the FCC "to investigate the merits of off-premises connectivity". Ultimately, we need more time and additional funding to complete our project. We have applied for additional EDU2011 funding in the existing E-rate year, in case funding is made available.

EDU2011 Timeline Information
In December 2010, the EDU2011 Proposal was submitted to the FCC. By March 2011, the FCC notified Piedmont City School District of their inclusion in the list of twenty selected to participate in the pilot program. There were several inquiries by the FCC to clarify the proposal specifics. The Piedmont City School District's proposal included a hybrid approach to providing off-campus Internet access via a combination of Mi-Fi devices and access through a citywide wireless mesh network.

In late November 2011, Piedmont City School District received the EDU2011 Funding Commitment Decision Letter from USAC. Immediately, vendor meetings were scheduled to launch the hybrid approach for providing off-campus student Internet Access.

Verizon Wireless had been selected as the wireless Internet service provider for those students living outside the citywide wireless network coverage area. Verizon provided 250 Mi-Fi 4G/LTE devices as the means of accessing the Internet. These devices were distributed to students during the months of February and March 2012.

In tandem with the rollout of Verizon Mi-Fi devices, Information Transport Solutions (ITS), the vendor providing Internet access for students and teachers, began construction of the citywide wireless mesh network. Nine wireless network gateways and over 200 wireless access points have been deployed over the city of Piedmont. An initial trial of student home Internet access via the citywide wireless network was conducted in March and proved extremely successful. Construction stands at 100% complete and testing of citywide wireless has been extremely successful.

Figure 1 - EDU2011 Pilot Timeline
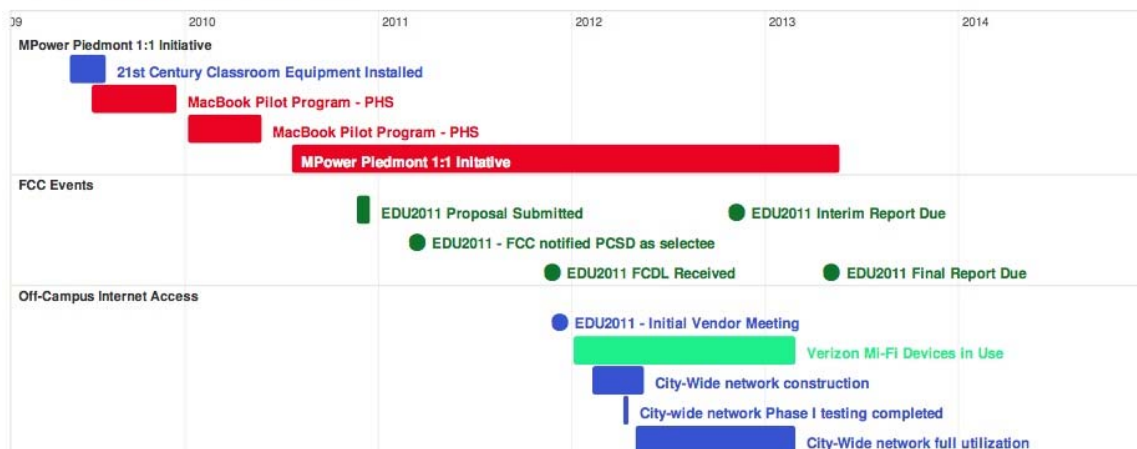
Required Reporting Information

Project Benefits
(a) A description of how the wireless devices were integrated into the project's curriculum and objectives (including approximately how many times per week the wireless devices were used to access program materials remotely and how many wireless devices were used during this period of time);

Beginning with school year 2010-11, Piedmont City School District adopted the ANGEL online learning management system. Teachers began posting course materials, assignments, and online assessments for students via their school-owned MacBook and Internet access through the campus local area network. By the end of the first semester, teachers had grown confident in the use of additional ANGEL features like the interactive discussion board, LiveChat for student/teacher interaction and setting up LiveOffice hours to provide homework help in the evenings. Prior to the *Learning on the Go* pilot, students without home Internet access were unable to participate in online learning except during the school day.

The *Learning on the Go* pilot provides equal access for all Piedmont City School District students to use the Internet to interact with their peers and teachers. Homework help has proven to be a very successful endeavor. Informal discussions with teachers in all grade levels reveal that students are completing assignments more frequently and with greater understanding that before the *Learning on the Go* pilot began. Students and teachers access the Internet nightly from home to complete assignments, perform research, and collaborate with peers on longer-term challenge based learning assignments.

The following section describes _"how many times per week the wireless devices were used to access program materials remotely and how many wireless devices were used during this period of time"_. Two methods were used to provide this access: Verizon MiFi cards and a vendor provided City-Wide Wireless Mesh Network.

School Principals conducted student surveys to determine those students (living beyond the coverage area of the citywide wireless network) that needed home Internet access. The results of this survey are shown in **Table 1** below:

Table 1 Student Internet Survey Results

| School	Students outside citywide network coverage area needing home Internet access
Piedmont Elementary School (Grades 4 & 5)	51
Piedmont Middle School (Grades 6-8)	79
Piedmont High School (Grades 9-12)	87

Verizon Component of EDU2011

Once the EDU2011 Funding Commitment Decision Letter was received (late November 2011), the district began working with Verizon Wireless to establish 250 accounts. Verizon provided 250 Mi-Fi 4G/LTE devices as the means of accessing the Internet. These devices were distributed to students during the months of February and March 2012. Students immediately began using the Verizon Wireless Mi-Fi devices on a nightly basis. Usage data is displayed in the table below:

*Table 2 - Monthly Verizon Wireless Mi-Fi Usage Data*

January 2012	3	50	.06
February 2012	593	150	3.95
March 2012	1260	250	5.04
April 2012	1311	250	5.24
May 2012	1305	250	5.22
June 2012	1196	250	4.78
July 2012	1492	250	5.97
August 2012	1217	250	4.87
September 2012	1469	250	5.88
October 2012	1477	250	5.91

Figure 2 - Verizon Mi-Fi Data
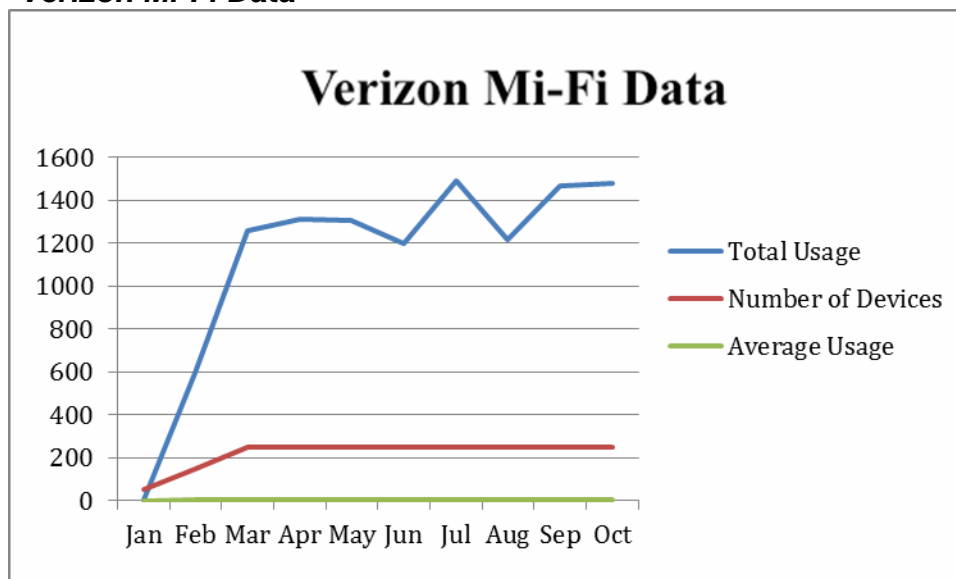
Verizon Mi-Fi Data

Although Verizon Mi-Fi Average Usage appears to be flat lined in **Figure 2**, it actually varies somewhat when the range of usage is analyzed. **Figure 3** (below) more accurately depicts Average Usage. It is interesting to see the spike in summer month usage, which is due to the PCSD Summer Virtual Academy.

Figure 3 - Verizon Mi-Fi Average Usage Data

Verizon Mi-Fi Average Usage Data
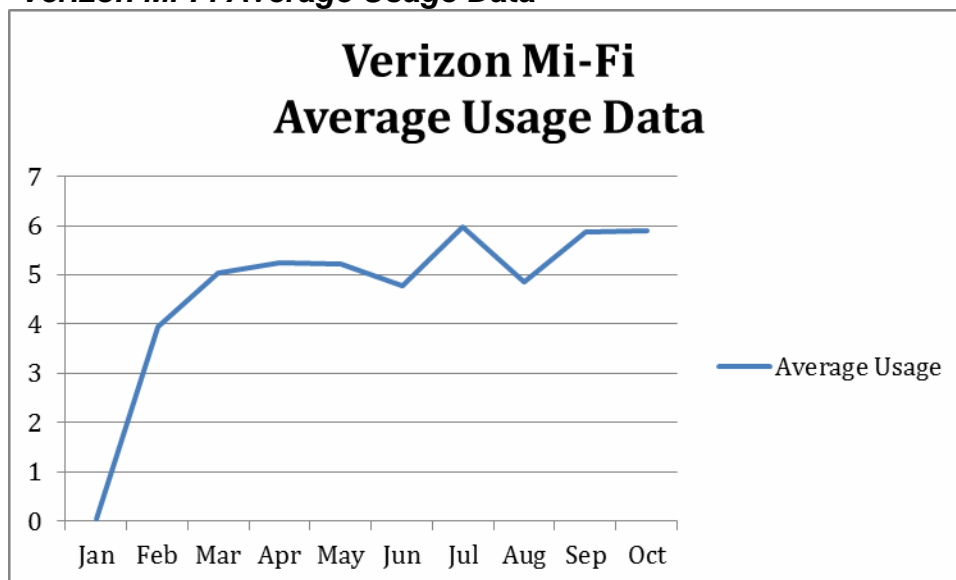
Citywide Wireless Mesh Component of EDU2011

The vendor chosen (via RFP process) to supply Internet access service through the citywide wireless mesh component was Information Transport Solutions (ITS), Inc. Initially, Internet access via the citywide Internet access portion of EDU2011 was

scheduled to begin Feb 1, 2012. Due to various delays, ITS began providing Internet access in phases beginning in March 2012, with Internet access to all areas by May 2012. The delays included: utility pole rental from multiple utility companies, utility pole installation, electrical connection to wireless routers on utility poles, fiber rental from local city-owned utility, and equipment delivery. The preliminary speed tests of the citywide wireless network indicated faster upload and download speeds than originally anticipated.

Since the beginning implementation of the citywide wireless mesh, average input data usage has increased from roughly 4MBps to 29Mbps, with the majority of data usage between the hours of 16:00 (PM) and 00:00 (AM).
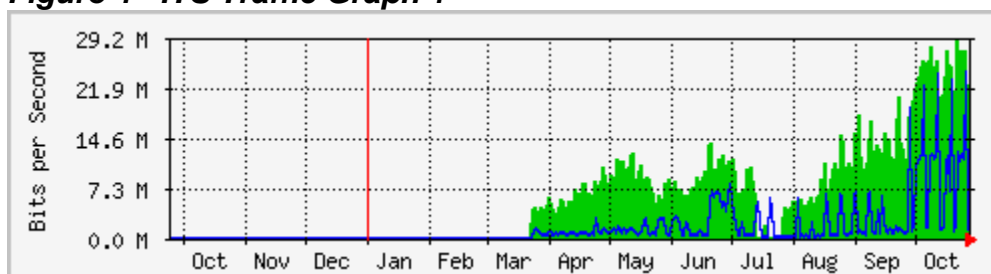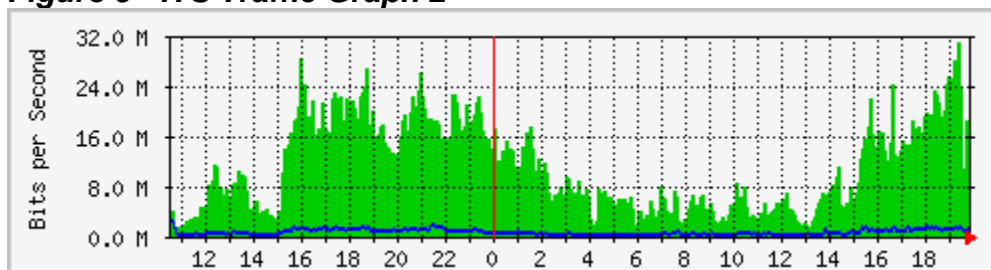
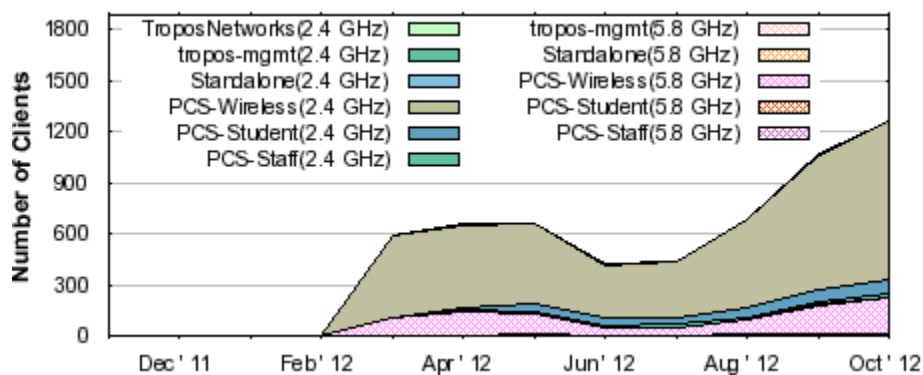*Figure 4 - ITS Traffic Graph 1*


Figure 5 - ITS Traffic Graph 2

The increasing number of clients since implementation began shows the citywide wireless mesh is becoming more utilized. The most utilized network has been the WEP protected PCS-Wireless network. Work is in progress to transition clients to the WPA protected network.

Figure 6 - ITS Client Data

The average download and upload speed a user can expect in the mesh network is between 9Mbps – 10Mbps. Throughput has improved the last two months as wireless backhauls are added in addition to wired backhauls.

Figure 7 - ITS Throughput Data
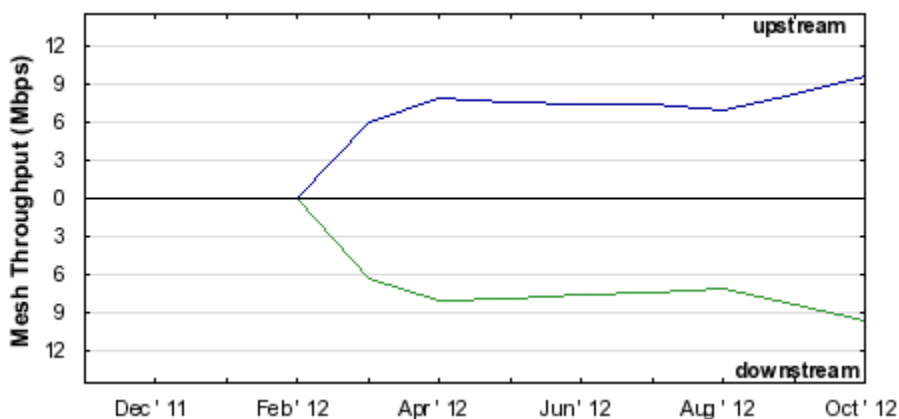
In order to get a snapshot of student <u>out-of-school usage</u>, the provider examined results between 15:00pm – 7:00am Monday, October 22 2012 to Friday, October 26 2012, the average number of clients accessing the mesh network was approximately 983 devices.

Table 3 - Client access to citywide wireless mesh network

Starting Timestamp	10/22/2012 - 15:00pm	10/23/2012 - 15:00pm	10/24/2012 - 15:00pm	10/25/2012 - 15:00pm
Hours (Duration)	17	17	17	17
Clients	961	974	1002	995

From results taken between 15:00pm – 7:00am Monday, October 22 2012 to Friday, October 26 2012, the average data usage for all clients is 137 Gigabytes (average nightly traffic/average number of devices)

Table 4 - Nightly traffic snapshot

Starting Timestamp	10/22/2012 - 15:00pm	10/23/2012 - 15:00pm	10/24/2012 - 15:00pm	10/25/2012 - 15:00pm
Hours (Duration)	17	17	17	17
MB/hour	125594.08	141894.15	129950.09	141572.04

(b) If available, a detailed summary of any data collected by the school or library on the project's outcomes and achievement of the project's goals, including usage of educational and research resources by students and library patrons and number of devices actually used;

Projects Goals
The local goals of this project were:
      1. To develop 21st Century skills in all students through the utilization of differentiated instruction, project-based learning, and flipped instruction.
      2. Transform the community of Piedmont through the development of an innovative school system that utilizes a digital learning environment.

Since the implementation of MPower Piedmont and the addition of home Internet access through EDU 2011/LOTG, the teaching and learning environment in the Piedmont City School District has been completely transformed. Students are fully engaged in their coursework. Students' creativity and innovative abilities continue to manifest as they become more confident with the technology available in the new digital learning environment. Students are conducting virtual study groups, engaged in community projects, and truly taking responsibility for their own learning.

Project Outcomes

District Assessment Data
There are various data sets that affirm student engagement and the increase in student learning. **Table 5** shows Year 1 vs. Year 2 Comparison of Alabama High School Graduation Exam (AHSGE) scores. Results show marked improvements, especially among females, minorities, and students who participate in the National School Lunch Program Free/Reduced. Additionally, the table shows impressive increase in the percentage of students who scored in the Advanced (Level IV) range:

Table 5 - AHSGE Score Comparison

	Proficient (Level III + Level IV)	Level IV	Females (Prof)	Females (L-IV)	Black (Prof)	Black (L-IV)	Free/Reduced (Prof.)	Free/Reduced (L IV)
Math (Year 2)	97.37	36.84	96.87	43.75	93.33	26.67	97.22	27.78
Math (Year 1)	89.86	17.39	86.11	22.22	83.33	8.33	86.05	4.65
Gains	**7.51**	**19.45**	**10.76**	**21.53**	**10**	**18.34**	**11.17**	**23.13**
Sci. (Year 2)	98.68	39.47	100	46.88	93.33	20	97.22	30.56
Sci. (Year 1)	98.55	37.68	97.22	25	91.67	0	97.67	25.58
Gains	**0.13**	**1.79**	**2.78**	**21.88**	**1.66**	**20**	**-0.45**	**4.98**
Read (Year 2)	96.05	25	96.87	34.38	93.33	20	94.44	19.44
Read (Year 1)	81.16	18.84	77.78	22.22	50	8.33	74.42	9.3
Gains	**14.89**	**6.16**	**19.09**	**12.16**	**43.33**	**11.67**	**20.02**	**10.14**

Student achievement results, as measured by the Alabama Reading and Math Test (AYP Assessment) have also showed dramatic increases.

The Piedmont City School District has is in year three of its MPower Piedmont initiative that placed laptop computers with all students in grades 4-12. Students have access to their laptops 24/7.

Figure 8 shows the percentage of students in grades 6-8 who scored proficient (Level III or IV) on the Reading Subtest of the Alabama Reading & Math Test (ARMT). This test is used to determine Adequate Yearly Progress for schools and districts in Alabama. It is important to note that students in these grade levels have participated in MPower Piedmont for two years. The chart shows the difference in scores between Piedmont Middle School students (65% Free/Reduced population) and the state average.

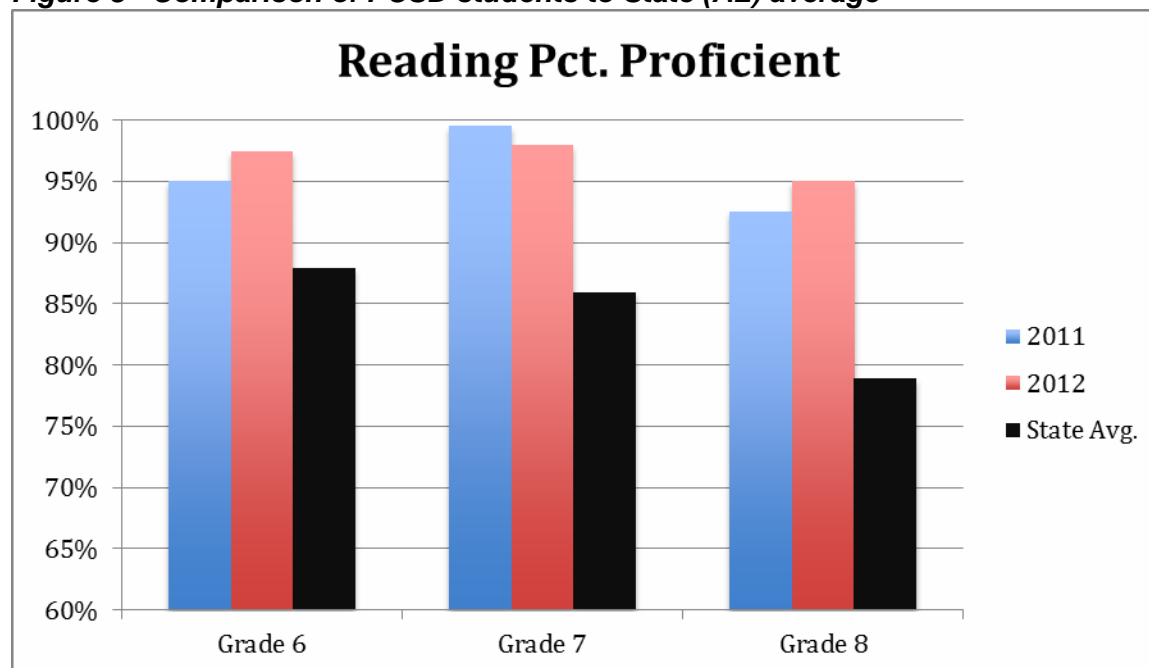*Figure 8 - Comparison of PCSD students to State (AL) average*

Figure 9 shows the percentage of students who score in the advanced range (Level IV) on the ARMT compared to the state average.

Figure 9 - Comparison of PCSD Students to State (AL) average Level IV Reading
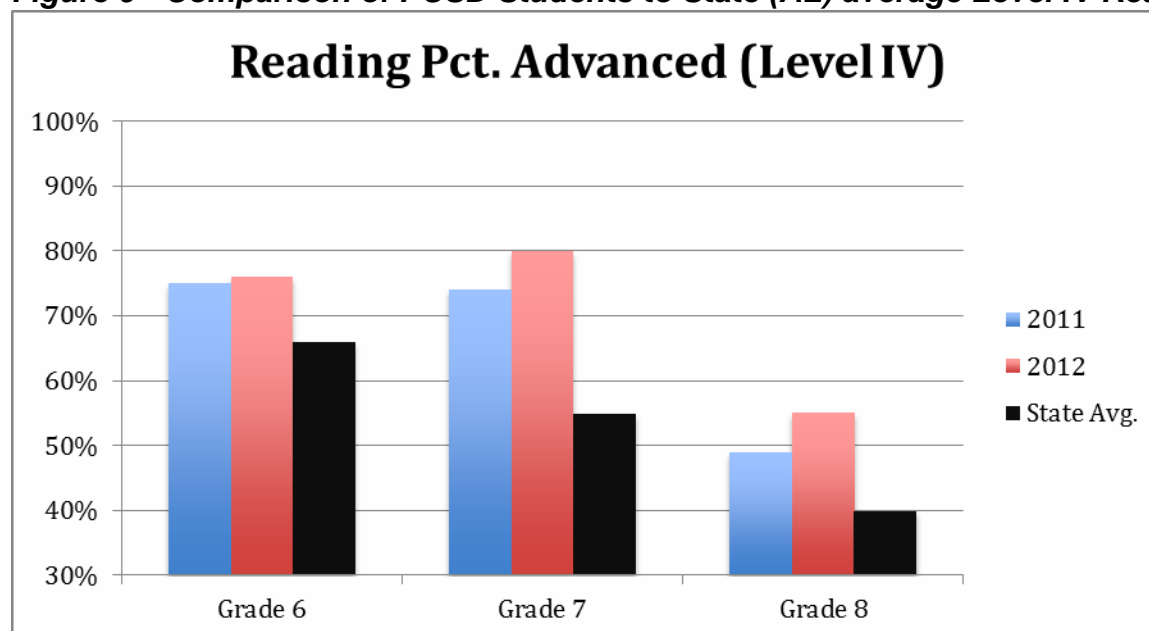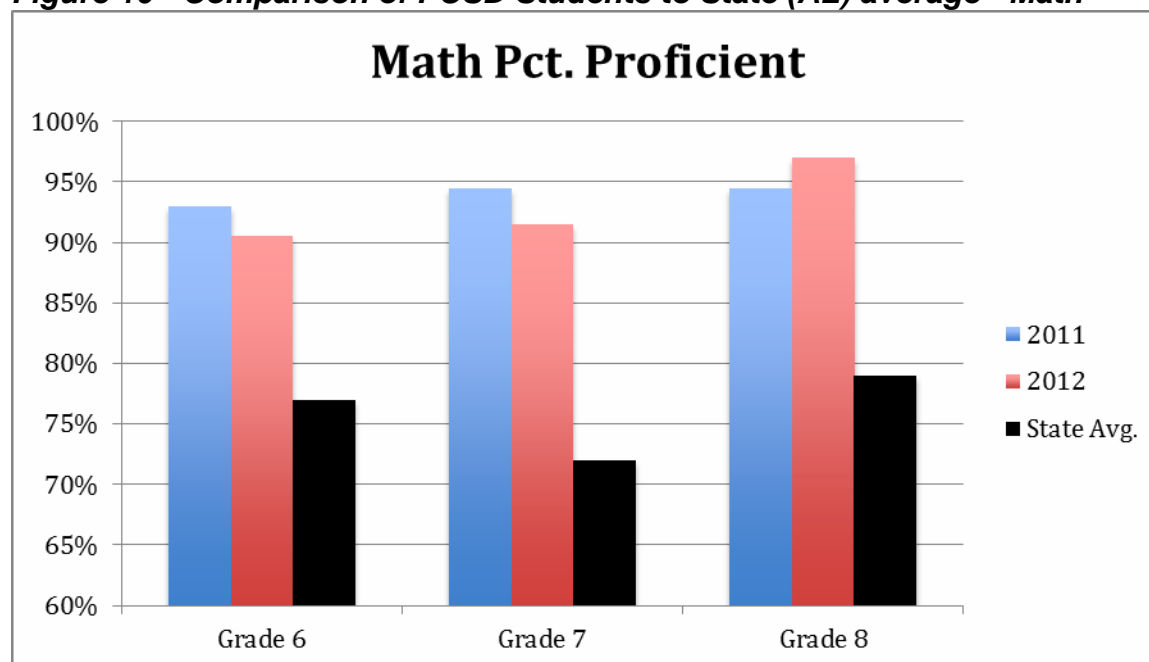
Figure 10 shows the same comparison as chart one for mathematics.

*Figure 10 - Comparison of PCSD Students to State (AL) average - Math*

In most cases the percentage of Piedmont Middle School scoring proficient in mathematics is double the state average.

Figure 11 shows the percentage of Piedmont Middle School students who scored advanced on the mathematics subtest of the ARMT.

Figure 11 - Comparison of PCSD students to State (AL) average - Math Level IV
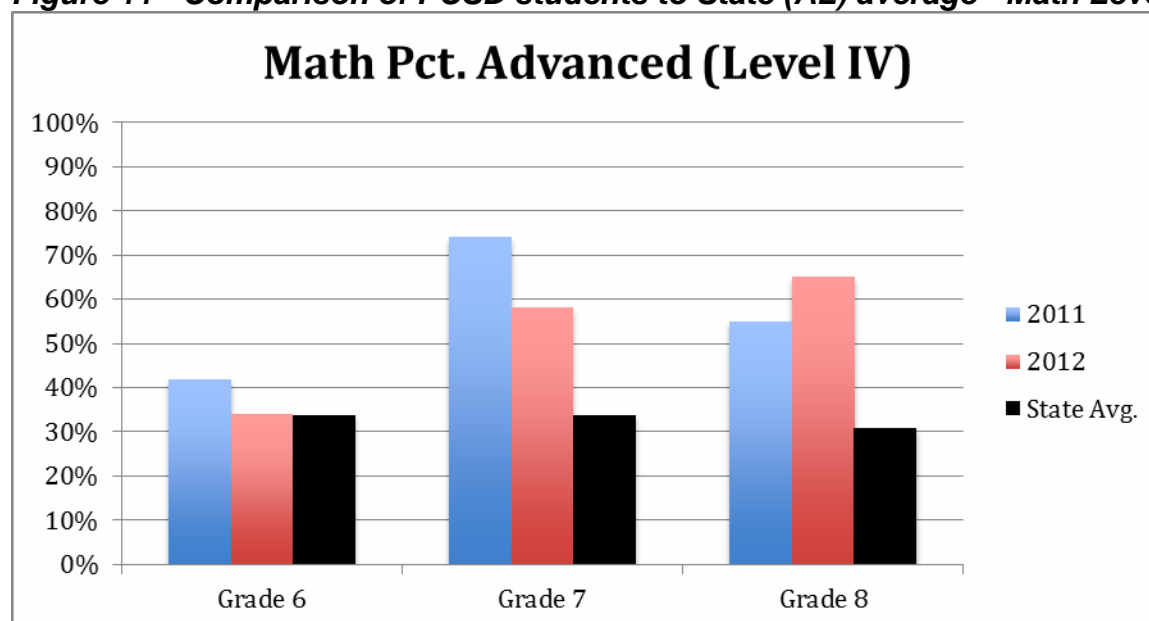
National Awards
Since EDU 2011/LOTG has been implemented in the Piedmont City School District, various agencies have recognized the District's schools accomplishments. The Council of Leaders in Alabama Schools (CLAS) has recognized Piedmont High and Piedmont Elementary Schools as CLAS Banner Schools. Apple Computer designated Piedmont High School as one of fifty-three national "Apple Distinguished Schools". The United States Department of Education named Piedmont High School as one of the nation's "Blue Ribbon Schools." We feel that these awards further validate the transformative work being accomplished in our schools.

City/Community Awards/News
As previously stated, one of the goals of this project was to transform the community of Piedmont. Community transformation is a long and tedious process that requires the work and commitment of all stakeholders. Although we are only beginning the journey of transformation, we have received early recognition of our efforts. Last summer, the Alabama League of Municipalities bestowed the City of Piedmont with their "2012 Quality of Life Award". A League of Municipalities spokesperson stated, "It was the MPower Piedmont initiative at the schools, and the partnership between the city and the schools, that have combined to give students the best opportunities possible."

In August 2012, perhaps one of the greatest indicators of community transformation, a new business locating in Piedmont, was announced. A car parts supplier and recycler announced that it would locate in a vacant industrial building. When making the announcement the business owner said, "The decision to locate in Piedmont came down to the little things," Hopper said, "Like the school district's laptop program and the free wireless Internet access for students."

Innovative Programs
Because of the availability of home Internet access provided through EDU2011/LOTG, the Piedmont City School District implemented a pilot Virtual Summer Academy for students in grades 4-11 during the summer of 2012. Three hundred and fifty (350) or approximately 50% of students volunteered to participate in the academy. Students were enrolled in one of the following classes that were developed and taught by district teachers:

1.   Playing With Poetry
2.   Mi Amigo: Basic Spanish
3.   Wilderness Survival Basics
4.   Guns That Changed America
5.   Herpetology & Ichthyology
6.   Classic Films 101
7.   Bible as Literature
8.   Music and Literature of 1900's

The following chart shows the average weekly hours that all students were logged into the district LMS on a weekly basis. It is important to note that all virtual class activities did not require LMS use.

Figure 12 - PCSD Summer Virtual Academy - Weekly User Activity Snapshot

PCSD Summer Virtual Academy
Weekly User Activity by Day
06/04/2012 - 07/24/2012
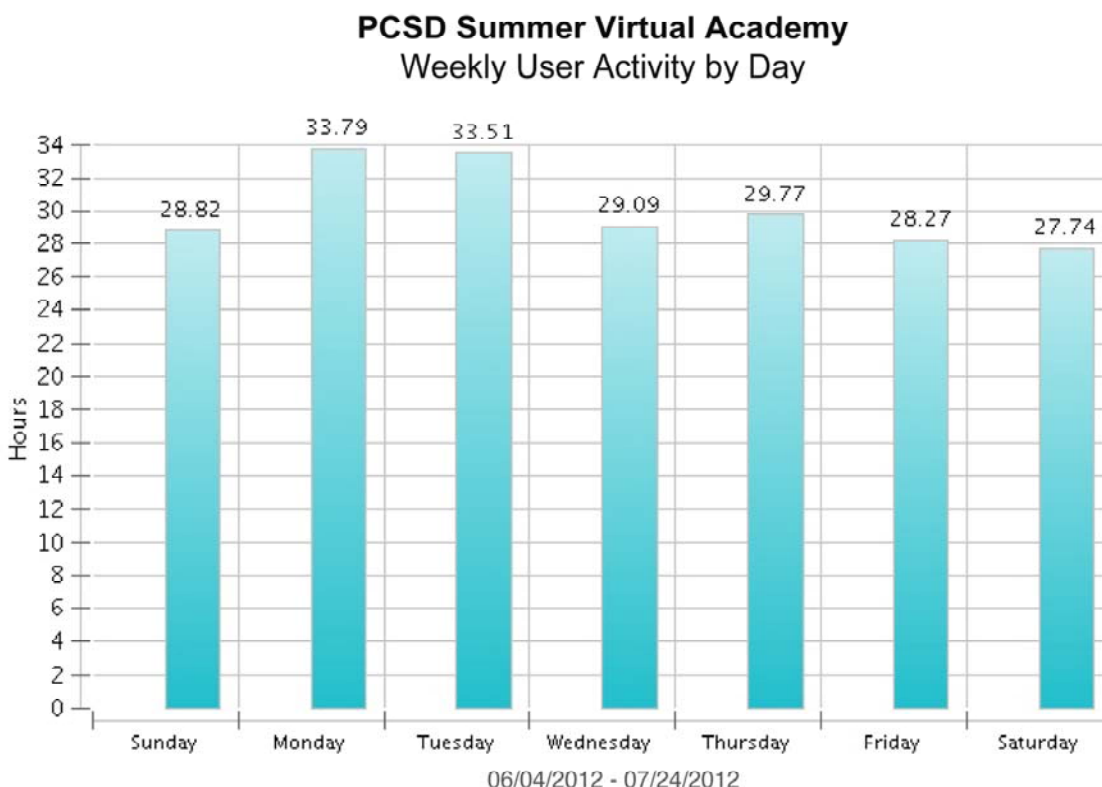
In conjunction with the Summer Virtual Academy, researchers from three prestigious universities (University of Chicago, Northwestern University, and the University of Washington) are engaged with Piedmont City School District to study the potential reduction of learning loss over summer months.

Beginning this school year, all students at Piedmont High School are taking at least one on-line class. These classes include: foreign language, US History, US Government, AP US Government, and Physical Science. By taking one of their core classes on-line, students' schedules are more flexible. This flexibility allows for students to take another high-school class (i.e. Yearbook, Drama), enroll in a dual-enrollment college course, or work a part-time job. Obviously, these opportunities would not be possible without Internet access at home for students.

(c) If available, a copy of any results or summary of the results of any survey given to students, teachers, parents or library patrons to assess any aspects of the off-premises wireless project; and

Formal surveys will be conducted at least twice during the pilot program. The first survey was conducted after 90 days of Internet access and at least one additional survey at the conclusion of the pilot program. *The University of San Diego surveyed parents and students about the EDU2011/LOTG program in July-August. We are still awaiting results from the survey.*

An informal interview with students and parents provide the following comments:

Brittany M's Mom: *"It means a lot to me because I study through the University of Phoenix online. It helps me with my school work so I can better support my children."*

Brittany M: *"I can do my schoolwork at home using ANGEL. If I don't understand what the teacher has taught, I can use other online resources to help me, like BRAINPOP. I now have all A's on my report card."*

Michael S. (Brittany H's dad): *"This will give my student access to the resources of the world in our home."*

Tatiyana G: *"I use online videos to help me with homework. Learning is more interesting."*

Tatiyana Gs Mom: *"I use the Internet to look up recipes to prepare for my family and I also look for better job opportunities."*

Paige A.: *"I can access my schoolwork at home. I can create my own videos and post them on YouTube. I am doing better in history."*

Brianna C.'s Mom (Jennifer): *"Now Brianna can access her homework from home rather than having to go to my parents' house. I am really thankful for this program because I cannot afford to have Internet access without it."*

Cameron S.: *"Having Internet access makes learning more interesting and easier. I can organize my homework better on the computer, too. We did have dial-up Internet access, but it was too slow and hard to use. I had to go to a restaurant or a friend's house to use their Internet to do my homework and study. My grades are getting better because learning with online resources is more interesting."*

Jesse C.: *"Having the MacBook and Internet access makes learning better because it is more advanced. It is better than books and paper because it is easier to organize and keep up with my work."*

Jesse C.'s Mom: *"Internet access is something I could not do for my son. I cannot afford Internet access or the MacBook. Now I can access my children's grades and schoolwork to make sure they are on track. We cannot afford a home telephone, Internet access allows my children to Skype with friends from school about their school work."*

Brandon R.: *"Learning is better with Internet access, because I can use Skype to talk with others when I need help."*

Brandon R.'s Mom: *"We did have Internet access, but when I lost my job I couldn't afford to keep it."*

Melissa F: *"It means a lot to me to have Internet access. It helps me with schoolwork. Internet resources are more accurate than textbooks, more up to date. My grades have improved. I used to have B's & C's--now I get all B's.*

Melissa F's Mom: *"Having Internet access makes it easier for Melissa to do her homework. Using the Internet to do her homework better prepared M. for college.*

Kaitlyn M: *"I look up (research) information that I do not understand to help me with my homework. I couldn't do that without Internet access."*

Austin D: *"My grades are improving because I can access Internet resources to help me learn."*

Project Costs (a) an analysis of the per student or per patron cost of the off-premises connectivity;

For schools, specify, by term used by the school (for example, by quarter or semester), the number of students and teachers involved or served as part of the project, the number of those students and teachers involved or served that were able to participate as a result of E-rate support, and, where appropriate, the number of students at each grade level using the wireless devices for Internet access for each specified term.

The Verizon Wireless portion of the EDU2011 *Learning on the Go* pilot program provides monthly 3G connectivity per Mi-Fi device at the rate of $42.99, with 80% of that cost being paid from EDU2011 funds and the balance (20%) being paid by Piedmont City School District. The district negotiated with Verizon Wireless to provide the Mi-Fi devices at no cost for the device

Table 6 - Verizon Wireless Monthly Service Cost

Cost per Mi-Fi	$42.99	0.00
EDU2011 Portion (80%)	$34.39	0.00
District Portion (20%)	$ 8.61	0.00
250 Mi-Fi Devices	$10,747.50	0.00
EDU2011 Portion (80%)	$ 8,598.00	0.00
District Portion (20%)	$ 2,149.50	0.00

The ITS portion of the EDU2011 *Learning on the Go* pilot program provides monthly wireless connectivity for 550 households, representing approximately 876 students, at the rate of $55.00 per student, with 80% of that cost being paid from EDU2011 funds and the balance (20%) being paid by Piedmont City School District. There are no wireless device costs associated with this Internet access service.

Per USAC rules this Eligible Internet Access can include service provider equipment costs and/or a non-recurring charge for capital investment by the service provider. However, in cases where applicants enter a multi-year contract and the upfront or non-recurring charge is $500,000 or more, the total charge must be prorated evenly over a period of at least three years. Applicants may not seek to recover more than one-third of the total non-recurring charges in any one funding year if they are $500,000 or more. The one-time installation per contract is $1,495,000 (Year 1: $498,333.34, Year 2: $498,333.33, Year 3: $498,333.33).

Table 7 - ITS Monthly Service Cost

Cost per student	$55.00	0.00
EDU2011 Portion (80%)	$44.00	0.00
District Portion (20%)	$11.00	0.00
550 households (serving ~700 students)	$30,250	0.00
EDU2011 Portion (80%)	$24,200	0.00
District Portion (20%)	$6,050	0.00
Amortized Costs:		
Year 1	**Year 2**	**Year 3**
$498,333.34	$498,333.33	$498,333.33

Effectiveness of Protective Measures
(a) A detailed description of the measures, including specific software or filtering mechanisms, that were taken to ensure compliance with the Children's Internet Protection Act as well as a description of measures that were taken to protect against waste, fraud and abuse; and

CIPA compliance is in place for Internet access both on and off campus through the district's content filter. Every student MacBook has the mobile m8e6 mobile client installed. The mobile client engages every time students open the MacBook. The mobile client detects every request for Internet resources and routes all traffic through our campus router to the district's content filter maintained by the Alabama SuperComputer Authority.

A Lightspeed Rocket device is being installed as part of the citywide Internet access portion of this project. This device will serve as content filter for Internet access provided through the citywide wireless network. Additionally, the device will provide more detailed reporting and monitoring of student Internet access.

(b) A detailed description of what, if any, issues arose in ensuring that the wireless devices were used only for educational purposes.

EDU2011, *Learning on the Go* orientation is an ongoing part of the pilot program. School administrators meet with parents and their student(s) to discuss appropriate use of home Internet access. The district has a Required Use Policy that defines appropriate Internet use for educational purposes only. Parents and students must agree to abide by the district's Required Use Policy as well as agreeing to only use the school-owned MacBook for accessing the Internet. Additionally, filtering software is installed on all district devices that routes all Internet traffic through a filtering system.

Lessons Learned
(a) A description of any technical, operational, or administrative problems or issues associated with implementing the project (such as barriers in using the wireless devices or difficulties with the service) and a description of how those issues were addressed or are being addressed; and

The terrain surrounding the Piedmont community makes wireless connectivity difficult. However, the Verizon Mi-Fi devices have performed well. In those areas where signal strength is low the use of an external antenna usually boosts the signal to usable quality.

Additionally, the Verizon Mi-Fi devices "lose configuration" which renders the device useless until it is reprogrammed. Ongoing technical support is provided by Verizon wireless network-tier support. The initial plan was to hand off individual technical support to Verizon within two weeks of rollout. To date, this has not been possible. Piedmont City School District Technology Department continues to work with Verizon's network-tier support personnel to isolate the root cause of the issues. Once the issue(s) have been isolated and a reliable fix is in place, Verizon Wireless will assume responsibility for supporting each student's Mi-Fi device.

ITS, the vendor installing the citywide access points, experienced delays in obtaining pole rights from utility companies. Those permissions have been granted and 85% of all access points have been installed. May 15, 2012 is the estimated date of completion of the citywide network.

(b) A narrative of the lessons learned as a result of the off-premise wireless project (for example, based on what you learned from the project, how would you plan and implement your project differently if you were doing it over again?).

Reflecting on the implementation of the EDU2011 *Learning on the Go* pilot program, we have indeed learned valuable lessons. If we could start again, we would have worked with Verizon Wireless using sample devices during the time we were awaiting to receive the Funding Commitment Decision Letter. By working through technical issues prior to actual implementation we could have provided a smoother rollout for our students and been able to "hand-off" individual technical support issues to Verizon much quicker.

Additionally, the delays in negotiating pole access could possibly have been avoided had these negotiations been conducted earlier in the process. Negotiations were delayed because neither the vendor nor utility companies were willing to sign contracts for utility pole access without a funding commitment from the school district (which was delayed by the Funding Commitment Decision Letter). Overall, construction of the citywide wireless network has progressed well once the Funding Commitment Decision Letter was received. Although the installation schedule had to be drastically compressed to meet deadline, ITS has performed well thus far.